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CASE REPORT

Spring loaded plunger attachment for retention of removable partial denture: a case report

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Abstract Since the establishment of implant in dentistry, the use of removable partial denture in replacing missing teeth apparently becomes less popular. The situation is made worse by the renowned limitations of removable partial denture. One of the obvious limitations of removable partial denture, especially in replacing missing anterior teeth is the unsightly view of metal used for retentive clasp. This case report describes the use of spring loaded plunger attachments as an alternative way to achieve retention and at the same time improving the aesthetic of the prosthesis.

Introduction

Since the blade implant was introduced in 1960s (Linkow, 1971, 1972 and 1973), different variety of endosteal types of implant were developed (Albrektsson and Wennerberg, 2005; Linkow *et al*., 2004; Scacchi, 2000). Ever since the publication of the recommendations on the consensus development conference on dental implant by Schnitman and Shulman (1979), and the result of 15-year implant treatments (Adell *et al*., 1981), implantology has taken centre stage as a well researched and predictable treatment modality. Implant treatments have become very popular among clinicians nowadays, outwitting the popularity of fix prosthodontics and the already less popular removable partial denture.

However, implant treatments did not come without limitations. Apart from being a very costly treatment, there are many factors that contraindicate its use, which include age factor, tobacco smoking, poor bone quality and poorly controlled systemic diseases (Palmer *et al*., 2002). As in the implant treatment, constructions of fixed prostheses sometimes are not recommended due to some limitations and contraindications (Kantorowicz *et al*., 1993). With the established limitations of implant and fixed prosthesis, the importance of removable partial denture cannot be denied.

A removable partial denture may require clasp(s) for direct retention. The traditional clasp has been used and proven sufficient to retain removable partial denture in place. However, the use of a traditional clasp as a retainer may have an aesthetic drawback, especially when the placement is at the anterior region. Hence, in this particular situation other options should be considered for the retainer as there are many other types of retainers in the form of intra-coronal and extra-coronal attachments available for the purpose (Jenkins, 1999).

Spring loaded plunger attachments are among the simplest and versatile extra-coronal attachments (McGivney and Carr, 2000). There are a number of products available in the market such as IC Attachment (Preat Corporation, California) and Swiss Tac (Attachment Incorporation, California). Since this attachment is buried underneath the acrylic plate in the removable partial denture, the placement of this type of attachment can solve the aesthetic problem caused by traditional clasp. However, the lab procedures are quite tricky and the technician's skill is eminent in order to provide effective retention and at the same time prevent the tooth movement or injury.

One of the spring loaded plunger attachment available in the Prosthodontics Clinic, School of Dental Sciences, Universiti Sains Malaysia is IC Attachment (Preat Corporation, California). It is a spring loaded bullet shape plunger housed in metal cylinder. The size is about 5mm to 6mm in length, and the diameter of the cylinder is 2mm, and the diameter of the plunger is 1mm. It is used for retention as a substitute for conventional clasp at the aesthetic concerned area. The attachment provides approximately the same amount of retention as clasp does (Wright, 1984), but it is invisible because it is embedded inside the acrylic plate and only the plunger part that project through the guide plate.

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This case report emphasized on the use of spring loaded plunger attachments in the management of aesthetic and retention of a removable partial denture.

Case report

A seventy-three-year-old Chinese gentleman was referred to the Prosthodontic Clinic, School of Dental Sciences, Universiti Sains Malaysia for the broken pontic (11) of his bridge extended from 12 to 22. The pontic was temporarily repaired by patient's dentist, and it required further management (Figure 1). Intra-oral examination revealed that the bridge abutments (12 and 22) were mobile with grade III mobility and periapical radiograph of those abutments showed periapical radiolucency (Figure 2). Other clinical findings were as follow: crown restorations were required at 15 and 26, amalgam restoration of 27(DO) needed replacement, and missing 24 required replacement for aesthetic and function.

Figure 1 Preoperative photograph showing repaired pontic (11) and marginal defect of bridge retainers (12 and 22).

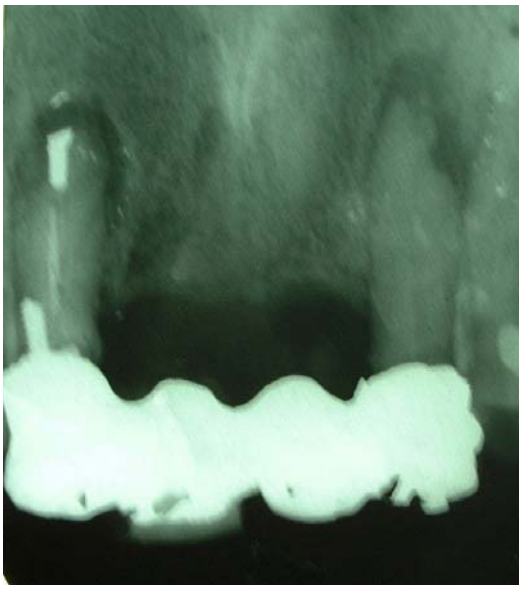

Figure 2 Periapical radiograph showing radiolucency at the periapical area of abutment teeth (12 and 22).

Several treatment options were discussed with the patient pertaining to the management of the problems. Removable partial denture was chosen to replace the missing teeth. The bridge abutments (12 and 22) were extracted and the interim denture was used to temporarily replace the missing teeth. While waiting for the extraction sites to heal, other treatments such as crown restoration of 15 and 26, and amalgam restoration of 27(DO) were carried out.

The design of upper removable partial denture was made (Figure 3). IC Attachment (Preat Corporation, California) was chosen for the retention of anterior region instead of traditional clasps for aesthetic reason. Cobalt-chromium frame work was constructed, and holes were drilled into the guide plates to make ways for the attachments (Figure 4). The attachments were set in place and the plunger parts were arranged protruded through the holes and in contact with teeth at about 1mm below the survey line of the undercut (Figure 5). The attachments were secured in place using DuraLay (Reliance Dental Mfg. Co., Illinois).

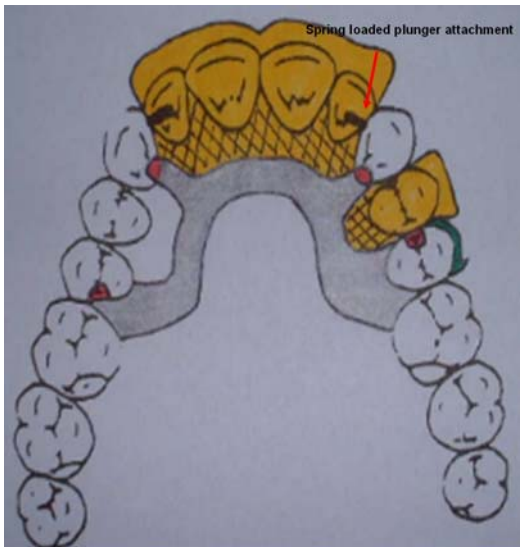

Figure 3 The design of cobalt-chromium denture.

The prosthetic teeth were set over the attachments and the denture was tried in the patient's mouth. The denture was issued in the next visit (Figure 6a and 6b). Patient was satisfied with his new appearance and function of his prosthesis, and after three months review, prosthesis was still in good function.

Discussion

Precision attachments have been used in the construction of removable partial denture in an attempt to improve retention and aesthetic of the prosthesis (Goto and Brudvik, 2002, Tsai and Shen, 1999). They are categorized into extra-coronal, intra-coronal, anchor, bar and auxiliary attachments (Jenkins, 1999) and their function is either via friction, mechanical retention, magnetic

Figure 4 Arrows showing the position of holes drilled on the guide plates.

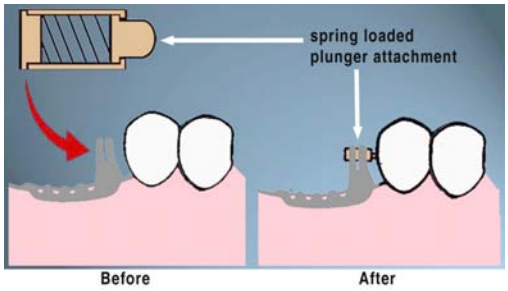

Figure 5 Diagram showing the positioning of spring loaded plunger attachment.

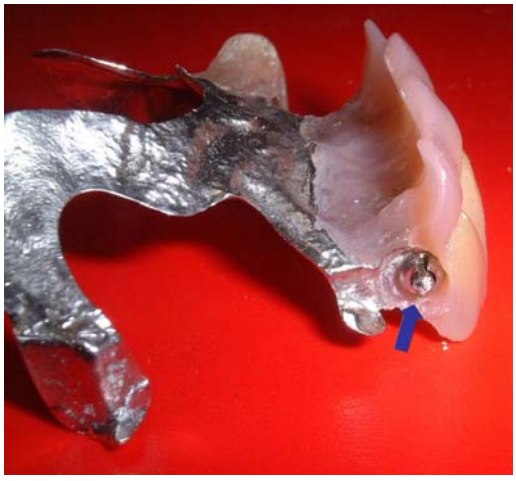

Figure 6a. Arrow showing the spring loaded plunger attachment in place.

Figure 6b. Spring loaded plunger attachments were not visible underneath acrylic prosthesis.

or screwed (Sherring-Lucas and Martin, 1994). Spring loaded plunger attachment belongs to the auxiliary attachment group, where the retention is achieved via mechanical retention.

Where conventional clasp will result in poor aesthetics, the use of a simple alternative mean of retention in the form of spring loaded plunger attachment has been reported (Wright, 1984). As in this case report, spring loaded plunger attachments were used instead of conventional clasp as retainers at the anterior abutment teeth (13 and 23). In addition to good retention, the use of spring loaded plunger attachments had enhanced the aesthetics of the prosthesis compared to when conventional clasps are used. However, the use of spring loaded plunger attachment has to be planned carefully to provide effective retention and to prevent tooth movement. Case selection is also very important because spring loaded plunger attachment has been found to be less stable with loading when used in the removable partial denture with maxillary distal extension (Berg and Caputo, 1992).

Apart from improving aesthetic and retention of removable partial denture, the availability of the precision attachments have made designing of removable partial denture becomes more flexible. Various cases with aesthetic and retention challenge can be solved with the correct selection of precision attachments. Thus, many unnecessary surgery and cutting of sound tooth for abutment preparation can be avoided in restoring missing teeth.

However, precision attachments are not without disadvantages. Most of the attachments are very small and come with many parts to assemble. Construction of such attachment requires skill from dental technicians, which cannot be acquired easily and needed training. Furthermore, the parts of the attachment are usually exposed to wear and tear, which needed replacement over the time (Walton *et al.*, 2002) and the part replacement procedure is also fastidious.

As a conclusion, removable partial denture still has a good place as a treatment option in replacing missing teeth. With proper case selection and treatment planning, precision attachment such as spring loaded plunger attachment can be used to improve retention and aesthetic of removable partial denture.

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